

What is claimed is:

1. A device for direct detection of a spatial position of a probe element in a multi-coordinate measuring apparatus, including a reference system comprised of at least one first and one second standard that are associated with coordinate axes of the measuring apparatus,

the first standard being a planar standard having a main surface carrying a line grating array which includes at least one two-dimensional line grating,

the second standard being an elongate standard noncontacting relative to the first standard, the second standard being movable in two dimensions and preferably disposed at right angles to the main surface, and wherein

provision is made for a first position measuring system for determining the spatial position of the second standard with respect to the first standard.

2. The device as claimed in claim 1, wherein the line grating array of the first standard includes the two-dimensional line grating and a one-dimensional line grating.

3. The device as claimed in claim 1, wherein the first position measuring system includes at least one first reading head and spaced therefrom a second reading head for detecting the line grating array of the first standard, said reading heads being provided on the second standard opposite the main surface of the first standard.

4. The device as claimed in claim 3, wherein either both reading heads of the two reading heads of the first position measuring system are associated with the two-dimensional line grating of the first standard, or one reading head is associated with the one-dimensional line grating while the other reading head is associated with the two-dimensional line grating of the first standard.

5. The device as claimed in claim 1, wherein the first position measuring system includes three distance sensors arranged in the corners of an imaginary equilateral triangle on the second standard on a side opposite the first standard.

6. The device as claimed in claim 1, wherein the second standard is provided on a column on which a carriage is movable along a guide, and extends parallel to the guide of the carriage,

the second standard is a prismatic body of preferably polygonal cross-section carrying two-dimensional line gratings on a first and a second surface, and

provision is made for a second position measuring system for determining the spatial position of a support member fixedly connectable with or integrated into the carriage with respect to the second standard.

7. The device as claimed in claim 6, wherein the second position measuring system comprises:

- a third reading head and, spaced therefrom, a fourth reading head, which are provided on the support member and associated with a first one of the two-dimensional line gratings of the second standard,
- a fifth reading head provided on the support member and associated with a second one of the two-dimensional line gratings of the second standard, and
- a fourth distance sensor for detecting the distance between the support member and one of the surfaces of the second standard (24) provided with a two-dimensional line grating or any surface parallel thereto, and

the support member is arranged on the carriage in such manner that the support member is prevented from contacting the second standard during the detection operation.

8. The device as claimed in claim 7, wherein the first and the second surface are two opposed parallel lateral surfaces of the second standard.

9. The device as claimed in claim 7, wherein the first and the second surface of the second standard are, respectively, one lateral surface and one end surface arranged at an angle thereto.

10. The device as claimed in claim 7, wherein the fourth distance sensor is provided on the support member in a defined position with respect to its reading heads.

11. The device as claimed in claim 7, wherein the standards are made of a temperature-invariant material.

12. The device as claimed in claim 7, wherein the support member is made of a temperature-invariant material.

13. The device as claimed in claim 7, wherein the second standard is configured for arrangement between two spaced longitudinal guideways forming the guide for the carriage.

14. The device as claimed in claim 7, wherein the second standard is an elongate rectangular plate.

15. The device as claimed in claim 7, wherein the support member is U-shaped in cross-section and carries on its two U-shaped arms the third and fourth and, respectively, fifth reading head.

16. The device as claimed in claim 7, wherein the support member is an angle bracket carrying on its two angle arms the third and fourth and, respectively, fifth reading head.

17. The device as claimed in claim 7, wherein the fifth reading head is provided on the support member in such manner that it lies opposite and level with the third or the fourth reading head with respect to a longitudinal dimension of the second standard.

18. The device as claimed in claim 6, wherein the carriage carries a three-dimensional probe assembly provided with the probe element and with a third position measuring system.

19. The device as claimed in claim 18, wherein the probe assembly includes further reading heads connected to the support member directly by way of a cantilever-type holding element.

20. The device as claimed in claim 19, wherein the holding element is made of a temperature-invariant material.